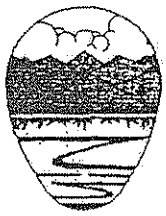

Controlling Struvite Buildups

Magnesium ammonium phosphate, sometimes called struvite, is a grayish-white crystalline salt that builds up on the internal pump and piping surfaces used for lagoon liquid recycling. It usually appears on metallic surfaces but also on plastics. Steel, cast iron, bronze, and brass are equally susceptible.

Struvite usually builds up on the internal pump components first, then moves outward to the discharge pipes. It often occurs at pipe joints, elbows, valves, or imperfections because grit and solids tend to lodge at these points, providing a base for the salt to grow. Predicting struvite is difficult because its cause is not well known. Design, maintenance, and management techniques have been researched that can reduce the buildup to acceptable levels.

Pumping and Piping System

Use only high-quality, low-pressure, self-priming centrifugal or submersible pumps. They should not be oversized in relation to the piping network, and should perhaps be on a timer. The suction pipe should also be large enough to prevent pump cavitation. Normally the suction pipe diameter should be one size larger than the discharge pipe. Locate the pump close to the high-water level to minimize suction lift. Replace fine mesh suction intake strainers with wire screens or baskets of 1-inch mesh or larger. The diameter should be at least five times the diameter of the suction pipe. Struvite will also build up on the screens.

Use nonmetallic pipes and fittings. Pipes should be large enough to maintain flow velocities between 3 to 5 feet per second; the minimum pipe diameter at any point except at the immediate discharge point should be 1.5 inches. Sharp pipe bends (elbows and tees) should be avoided. Instead, use flexible plastic pipe and long sweep elbows for the direction changes. The system (pumps and piping) should have sufficient capacity to work only one-half to two-thirds of the time, and piping systems not in continuous use should be drained between pumping events.

Electrostatic Charges

Stray voltage is also believed to contribute to struvite. Direct grounding of the pump housing can discharge any static charges. A metal rod should be placed 10 to 12 feet into the moist soil near the lagoon's edge, and cable connections at the ground rod and pump should be checked periodically for corrosion.

Lagoon Management

Lagoons should be properly sized. New ones should be charged at least half full of water before startup, and the liquid level should be brought up to design levels as soon as possible. Rainfall during normal years dilutes lagoon liquid while extended periods of hot, dry weather increase nutrient and salt levels and the rate of salt buildup in recycling systems. Flushing with fresh water or irrigating a portion of the lagoon contents may help.

Acid Cleaning

Salts can be dissolved with dilute acid treatments. Several doses followed by flushing the spent acid solutions will be needed to treat heavy buildups. A more thorough and more costly method is to install an acid recirculation loop. Use a 150-gallon acid-resistant tank as

the reservoir. You will need enough solution to fill the pipe length and some in reserve to keep the recirculation pump primed. Use the accompanying table to determine how much acid you will need.

Table 1.—Amount of solution needed for acid cleaning using an acid recirculation loop.

DIAMETER OF PIPE, IN INCHES	SOLUTION NEEDED PER FOOT OF LENGTH, IN GALLONS
1.0	0.06
1.5	0.13
2.0	0.20
2.5	0.29
3.0	0.43
4.0	0.70
6.0	1.53

To reduce the size of the tank, isolate sections of the line with valves and circulate the acid through only one section. The flush pump suction is switched from the lagoon and connected to the bottom of the acid tank with a quick-connect coupling. A 1-inch line returns acid from the end of each treated pipe section to the tank.

Hydrochloric acid can be purchased at most chemical supply houses or paint stores. Dilute the acid with water on a 1 to 9 ratio — 1 gallon acid to 9 gallons of water. Use caution. Mixing acids with water is a hazardous operation. Partially fill the tank with water, then add the acid slowly to the water. Eye protection is essential, and heat will be generated. To treat heavy struvite buildups, recirculate the mixture overnight and count on using the mixture only once. Spent acid may be dumped into the lagoon. Acids currently cost about $14 for a 15-gallon drum or about $33 for a 50-gallon drum. Deposits on the drums are $25 and $50, respectively.

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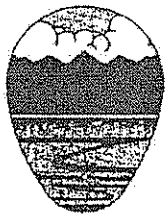

Protection Against Pests, Predators, and Darkling Beetles

Pests, often called vectors because they may be a point of entry for disease or other nuisances in the poultry house, are an aspect of waste management that should not be overlooked. Vectors can be either living or nonliving carriers of disease. Especially troublesome on the poultry farm are house flies, rats, and darkling beetles. Wildlife, especially feral dogs and coyotes, must also be controlled. Having proper waste management facilities and maintenance procedures on the farm will contribute to productivity, nutrient management, and environmental safety. A cost-effective and safe pest control system is essential.

Uncontrolled pests cause irritation to birds and workers, carry poultry disease pathogens, increase mortality, lower carcass grades and production, damage building materials, and interfere with feed conversion. In addition, and if they did nothing else, poultry pests must be carefully controlled because they can migrate from litter to nearby residences, where they may become a serious nuisance among the neighbors.

Flies

Moist manure is not only a threat to surface and groundwaters; it is also an ideal breeding ground for flies. Caged layer operations are most susceptible to this problem, followed by breeder farms and, occasionally, broiler farms. Wherever poultry houses are susceptible to flooding, or litter is stored outdoors, the potential exists for fly-control problems.

Flies, which generally become active in the early spring (mid-March in many areas), have four stages of development: egg, larva, pupa, and adult. Most generations require about two weeks to develop. Females will produce 120 to 150 eggs in three or four days, and hatching occurs between eight and 24 hours later. House flies can complete their entire life cycle in as few as seven days; therefore, many of these 150 flies will also breed within a few days. Twenty to 30 generations in a fly season is not unusual. As many as 1,000 flies can develop in a single pound of suitable breeding material.

The actual rate of development depends on the temperatures and moisture levels in the breeding area. Since fresh manure is about 75 percent moisture, and flies breed in areas containing 75 to 80 percent moisture, poultry litter should be kept as dry as possible. Leakproof waterers should be installed and maintained in good condition. Broken eggs and mortalities among the flock should be cleaned up immediately.

Manure should be removed from the house every four to seven days during hot weather. After removal, it must be stored and used properly to achieve fly control. If manure can be dried quickly or immediately liquified, it will not become a breeding ground for flies. During land applications, poultry manure should be spread thinly to promote drying. If fly larvae are in the manure, then incorporating it into the soil as quickly as possible will help break the fly development cycle.

Under certain conditions, insecticides may be used to control adult flies in barns and poultry houses. But these products should be reserved for critical times when the management system breaks down, because flies quickly develop resistance. Insecticide applications may

be regulated in some states and should be handled carefully to minimize any harmful effects associated with toxic ingredients.

Rats and Mice

Voles, field mice, and cotton rats are not usually the source of problems for poultry growers. Norway rats and roof rats, however, are two non-native species of rats that can be troublesome — and they proliferate rapidly. A pair of rats will produce six to 12 young in 21 days — and each of these becomes sexually mature in three months. A single pair of rats, if they find food, water, and shelter, can produce a colony of 640 rats in a year.

Poultry houses provide everything the rats need: food, water, and shelter. Norway or wharf rats usually nest under buildings and concrete slabs and in garbage dumps. They are great burrowers and may have an extensive system of burrows under the poultry house, with several escape routes. They eat anything but prefer nuts, grains, meats, and some fruits. They can easily find meats and grains in the poultry house.

Roof or black rats are more aerial than Norway rats. They enter buildings from the roof or utility lines. They usually live in trees, so access to the poultry house is easy: up the walls, across vines, along pipes. Exterior walls should be hard, flat surfaces, and all entrance holes should be plugged up. Rats can make themselves "paper thin" to come in under doors and through holes as small as one-half inch in diameter.

The best rat control program is proper resource management, maintenance, and sanitation; but the food supply in the poultry house makes rat occupation probable. Some chemical controls or rodenticides may, and probably should be, added to your control program. To administer rat poison effectively, first know how many rats you are dealing with; then, establish bait stations near the walls in areas of rodent activity.

To determine how many rats are in the poultry house, observe the area at night as well as in the daylight. Rats are nocturnal; if you see no rats in the day or at night, there probably are not many around. If you see old droppings or gnawed areas, no rats during the day, and only a few at night, rats are probably present in medium numbers only. Finally, if you see fresh droppings and tracks, some rats during the day, and three or more at night, large numbers are probably present.

To control the infestation, use single or multiple doses of a rodenticide in the bait stations. Avoid making the rats sick; if they get sick and do not die, they will become bait-shy and not eat the poison. Place the bait stations appropriately and protect them from moisture, dust, and weather to encourage the rats to eat from these stations. Rats, like many animals, prefer fresh food.

Because rats are colorblind and have poor eyesight, rodenticides can be marked for safety. If other conditions make poisons inadvisable, rats can be trapped with common snap traps, glue boards, or in live traps.

Darkling Beetles

Known as litter beetles, lesser mealworms, or "black bugs," the darkling beetle (*Alphitobius diaperimus*) is found in large numbers in poultry houses, in the woods, and around feed bins. These black or reddish-brown beetles are troublesome in turkey and broiler production because deep litter and open-floor housing provide an ideal habitat in which the beetles can survive and reproduce.

The total effect of darkling beetles on poultry production is not known. They may be more problematic as a nuisance than as a vector (carrier of disease). However, beetles are thought to harbor a number of disease organisms — for example, fowl pox, *E. coli*, *Salmonella* spp., Newcastle disease, and avian leukosis — and to be involved in the transmission of the causative organism for Marek's disease, although immunization against Marek's disease is now available. Darkling beetles are also an intermediate host for poultry tapeworms and cecal worms. If they are in litter that is land applied, their possible effects on wildfowl must be considered.

An undisputed second concern related to the darkling beetle is that they can damage the insulation in poultry houses. Larvae bore into the insulation to find safe places to pupate. But adult beetles who eat the pupae soon enlarge the larval tunnels in their search for an easy

meal. Birds and mice then claw at the insulation to get at the adult beetles, larvae, and pupae. In a severe darkling beetle infestation, as much as 25 percent of the insulation can be lost in a single year.

Another potential problem arises if infested litter is spread on crops. Adult beetles may migrate from the field into nearby residences; the result can be a nuisance complaint to the health department — and sometimes lawsuits.

Temperature and moisture affect the amount of time an insect needs to complete its life cycle. Temperatures between 60 and 100 °F and moisture levels above 12 percent are optimum for its survival. Food sources, decaying litter, an occasional bird carcass, and the absence of major predator and parasite complexes in the poultry house help the beetle population to increase.

The life cycle of the beetle takes 35 to 60 days to complete. The adult female lays eggs individually or in clusters at intervals of one to five days throughout her life cycle. The eggs hatch into tiny larvae after four to seven days and grow through five to nine stages, called instars. This period lasts for seven weeks; then the beetles pupate in cracks and crevices, in the soil and lower strata of the litter, and in building insulation. The pupal state lasts for seven to 11 days, after which a new adult emerges.

To manage darkling beetles effectively requires monitoring, cultural practices, and some insecticide applications. Treatment should be maintained regularly, even if beetle numbers are low. Individual beetles or larvae (100 or fewer) pose no problem; however, their presence indicates a need for continued monitoring, ideally on a weekly basis, from the time the birds are brought into the house until they are removed. Visual inspection is the best way to monitor the open-floored, deep litter house. The grower should look at litter, carcasses, cracks and crevices, equipment, and insulation at intervals of 30 to 40 feet throughout the house.

- Litter should be examined along walls, around support posts, and under brooder hoods and feeders. Dig down 1 to 2 inches in caked litter to look for small, early instars.
- Carcasses should be examined during daily collections. A large number of beetles on a large number of carcasses may point to a heavy infestation.
- Equipment and cracks and crevices are favorite beetle habitats. Be sure to check the framing joints and other cracks as well as the brooder guard, house dividers, drinkers, and feeders.
- Insulation in new houses should be checked for clusters of small holes along seams, in corners, at the eaves, and along the gable. Insulation board may also be discolored. If mice damage appears, look also for beetle tunnels. In older houses, it will be hard to distinguish between old and new beetle damage.

Trapping beetles is a second control method. Traps can be made using a 2-inch schedule 40 PVC pipe, a 10-to-12-inch section for each trap. Put a roll of corrugated cardboard (brooder guard) inside the pipe, and place six or so traps between the wall, feeder, and brooder locations from one end of the house to the other. To prevent the birds from moving the traps, stake the traps in place. Remove the cardboard and count the beetles on a weekly schedule. Their presence or a rapid rise in their number indicates a need for treatment.

Cultural methods for controlling beetles are nonchemical ways to reduce the pest population. Cold weather is the most effective measure, and proper litter handling is also an essential for good control. If the weather cooperates, open the house to the cold between flocks. If the temperature drops below 30 °F, all stages of the darkling beetle will die. As soon as the birds are moved, the grower can remove litter and litter cake from the poultry house. Darkling beetles will move to protected areas in the empty house within a few days; therefore, moving the litter before that time will more effectively control the beetle population.

Fresh litter that is applied to cropland should be incorporated to prevent any return of the darkling beetle. Stockpiled or composted litter should be turned every two weeks to promote enough heat to kill beetle eggs and larvae.

Although all insecticides registered as controlling darkling beetles will work, none controls the house for more than one flock. Therefore, a treatment program should be maintained year-round. Most products remain active about a week and are designed to be applied when the birds have been removed from the house. The best time for application is on the first day after the birds have been removed followed by cleanup immediately on the second day. Treating the house again — and its outside perimeter — just before the placement of a new flock, is also useful. Surface sprays, dusts, and baits are available for making these applications.

Beetles love temperatures between 70 and 90 °F; they are nocturnal and can be found everywhere. Seeing them during the day is a sure sign of infestation — of their presence in great numbers. Young chicks will eat them. Darkling beetles can fly up to one mile a night. If a million or so are taken from a house, 15,000 of those taken will return in the direction of the house from which they came. Approved insecticides are Rabon, Sevin, and boric acid compounds. Best control methods are careful cleanout and spraying.

Beetles cause reductions in feed conversions and weight gains, and possible disease. Under dry conditions, they will eat the flesh of dead or down birds, and at night crawl up the feathers of resting birds and bite the skin around the feather follicals. Bitten birds may have weeping skin lesions or pink and swollen areas around the feather follicals that resemble skin leukosis. The birds are forced to rest and wander all night instead of eating and sleeping as they would in properly managed houses.

Darkling beetles are a general nuisance because they are attracted by light; therefore, they will crawl out of the litter and move toward the light at night. Large numbers of beetles on or in houses create a negative public image and give rise to complaints against the broiler producer. To prevent migration, spray the pit walls and posts, or use well-sealed, angled, metal flashing attached to pit walls at posts and masonry frame wall joints.

Coyotes and Feral Dogs

Coyotes and feral dogs are opportunistic feeders. If they live in the area, their presence around a poultry house is not remarkable. They will kill the poultry for food, but they can easily be prevented from gaining access to the house. Complete confinement of the poultry is the best way to stop predation. Heavy wire should be used to cover all openings. Sanitation and the proper disposal of mortalities will cut down on the attraction of coyotes to the area.

Predator calling and shooting may be used in most states to harvest these animals. Predator calling is a mechanical device that attracts the animals within shooting range. Trapping is also an effective control method. Traps and trap sizes as well as hunting and trapping seasons may be regulated in some places. Leghold traps that do not harm the animal or traps with padded jaws may offer the best control in some situations.

Controlling animals and pests in poultry houses involves a combination of resource management, sanitation, and exclusion, and some special measures such as chemicals, hunting, or trapping.

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OTHER ENVIRONMENTAL ISSUES

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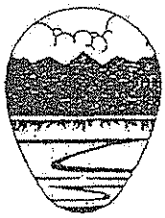

Constructed Wetlands

Agricultural runoff contributes about 60 percent of the nonpoint source pollution that threatens water quality in the rivers and lakes of the United States. Water that flows off the land after precipitation events picks up fertilizers and animal wastes that have been applied to the soil and deposits them in lakes and rivers.

If the runoff is uncontrolled, it causes soil erosion and the flow of high amounts of suspended solids, nutrients, pesticides, herbicides, and metals into the receiving waters. Flooding and the degradation of rivers, streams, and lakes are the consequence. Nonpoint source pollution can also threaten groundwater quality as the same pollutants leach through the soil.

Runoff can be controlled. Best management practices (BMPs) can be adopted as part of the poultry grower's operating procedure. For example, stormwater can be diverted from poultry houses and manure storage areas, and land applications can be made when no storms are predicted. In addition, the arsenal of BMPs now includes the use of natural or constructed wetlands for treating runoff and wastewater.

Functions of Wetlands

Wetlands are defined as transitional areas between the land and water. They support water-tolerant or aquatic plants, and their soils are saturated (waterlogged) or covered with shallow water for some part of the year. Bogs, swamps, marshes, and sloughs are types of wetlands.

Wetlands help improve water quality, store floodwaters, reduce erosion, and recharge groundwater. They are also habitat for wildlife and home to about one-third of our endangered species, though our focus is on wetlands for waste treatment. The treatment process involves complex physical, biological, and chemical interactions, but it can be simply described.

If surface runoff flows through wetlands before reaching open water, its progress will be slower here than in channelized flows over drier lands. Suspended solids will settle or filter out, and microorganisms will pick up the organics and nutrients in the water for food. Metals will settle into the soil and be absorbed by plants. Thus, pollutants in stormwater runoff can be reduced, cleansed, or transformed into harmless substances during the runoff's passage or treatment in natural or constructed wetlands. Most pollutants are transformed into basic elements, compost, or biomass.

The constructed wetland is the heart of the treatment system. It cleans wastewater by filtering and settling solids, decomposing organics, and adsorbing/absorbing other pollutants such as phosphorus and trace metals. The dissolved organic pollutants are removed by a complex group of microbes (bacteria, fungi, algae, and protozoa) that live in the wastewater and on plant and sediment surfaces. Since waste materials are food for most of these microbes, pollutants are gradually converted through complex food cycles into environmentally harmless by-products (gases that escape to the air and inert solids that stay in the system).

The primary purpose of wetland plants is to provide a place for these microbes to attach and grow. Generally, treatment effectiveness increases with plant density, which allows a larger quantity of attached microbes to exist within the system. The density of plants also affects flow hydraulics. Uniform flow is enhanced by uniform plant densities, but variable densities create short-circuiting which

reduces the retention time and treatment effectiveness of the wetland. In addition, plants make the system attractive and provide food and shelter for wildlife.

The system remains effective during winter because the microbes are still present on the dead stalks and stems of the vegetation. Because the biological processes slow down during winter, wetland systems are typically sized to meet treatment objectives during cold weather.

Notwithstanding their usefulness, over 50 percent of the natural wetlands in this country have been destroyed, according to estimates from the U.S. Fish and Wildlife Service. Wetlands have been drained and converted into farmland or drained and filled for urban development. They have even been used as dumps for hazardous wastes. Until recently, many people believed that wetlands were nothing more than a nuisance — a source of mosquitoes, flies, mildew, and unpleasant odors. These attitudes and our care of wetlands is changing rapidly as we become more knowledgeable about total resource and animal waste management procedures.

Section 404 of the Clean Water Act protects our nation's wetlands by regulating the discharge of dredge or fill materials into most wetlands, and the U.S. Fish and Wildlife Service purchases some wetlands each year with federal funds. Numerous private incentives also support wetlands conservation. For example, the 1986 tax reform bill prohibits deductions by farmers to drain or fill wetlands, and the 1985 Swampbuster Program removes both flood and crop insurance and price supports from farmers who drain wetlands.

Designing Constructed Wetlands

Constructed wetlands can effectively treat poultry industry wastewaters, including stormwater runoff. These wetlands are designed by engineers and built to restore, enhance, or replace the physical, chemical, and biological processes in natural wetlands. They are typically used as polishing cells following conventional primary treatment facilities such as lagoons, settling basins, or septic tanks. The integrated treatment system provides a higher quality wastewater that may be recycled or discharged to a receiving stream if appropriate permits are obtained.

In addition, the volume of treatable wastewater may be substantially reduced during the growing season because of evaporation. For example, a poultry producer currently having difficulty with overflowing lagoons during wet weather now has the option of adding constructed wetlands, which can be used to hold the lagoon wastewater during the growing season. Typically the wastewater in the wetlands will evaporate or percolate into the soil, but any effluent can also be recycled as process waste or as irrigation water.

Constructed wetlands consist of one or more "cells" of wetland plants in series or parallel. Construction can be easily accomplished. Excavate the area to shape the bottom of the wetlands and build small dikes around it. Use PVC pipe to distribute and collect wastewater and to control water levels in the wetland. Water levels are normally shallow — about 3 to 12 inches. Uncontaminated runoff can be diverted from the system by berms or other buffers or grading.

A lagoon, detention basin, or other type of solids trap is used in front of the constructed wetlands to remove heavy or coarse solids. Some runoff contains high sediment loads and decomposing organic matter that may settle in bottom deposits. Because these deposits can adversely affect the hydrology and life forms in the wetland, the solids trap is particularly important.

Most wetland systems for treating agricultural related wastewaters will not be larger than 1 or 2 acres. In general, they should not be located in areas with steep topography, shallow topsoil, or limited space. They must be properly constructed to ensure groundwater protection. The potential for constructed wetlands to adequately treat agricultural wastewaters is so great that the USDA Agricultural Stabilization and Conservation Service has approved the development of cost-sharing for this practice. Consult your local soil and water conservation district for more information.

Management

Wetland plants include mixtures of cattails, reeds, bulrushes, sedges, and grasses that are

normally native to the area. The plants provide the right conditions for the microorganisms that live in the wetlands and break down the pollutants.

Pond and wetland systems are particularly effective because ponds can be designed to catch the stormwater and slowly release it to the wetlands following the storm. This technique keeps the wetlands wet for longer time periods, which can be especially important during dry seasons.

The systems need little routine maintenance but should be inspected periodically to detect any loss of plants, leakage through the dikes, clogging of the pipes, mosquitoes, or short-circuiting of the flow. These problems and others are usually easily corrected.

Properly managed constructed wetlands are cost effective, energy efficient, and simple to operate. They accept varying pollutant loads, attract a variety of wildlife, and add beauty to the farm landscape. Above all, constructed wetlands can help achieve clean water.

Information on the design and construction of wetlands for managing wastewater is available from USDA Soil Conservation Service local offices.

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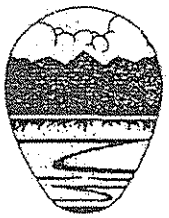

Feeding Litter To Ruminants

Broiler litter has long been considered a problem by-product. It is usually applied to the land as a fertilizer, but the concentration of the industry in relatively small geographic areas contributes to an oversupply of litter for this purpose. Broiler litter that is not managed in an environmentally sound manner may contribute to surface and groundwater contamination. An alternative, and indeed a more economical, use of broiler litter is as a source of dietary nutrients for beef cattle and other ruminants, whose unique digestive system is well able to process wastes and other by-products. Turkey litter and poultry manure can also be used for this purpose.

Litter is a source of protein, energy, and minerals. Using it as a feed ingredient helps to conserve nutrients and to offset costs. The plant nutrients in the litter — nitrogen, phosphorus, and potassium — and other minerals will be redeposited on pasture land as cattle manure. For this reason, even when the cost of transporting the litter is factored in, feeding litter to ruminants can be an economical waste management technique.

There may be a problem with the public's perception of litter as a cattle feed. We readily accept and even prefer vegetables that are organically grown — in fact, mushrooms go directly from the manure bed to the grocery store — but we have a hard time accepting litter as a food ingredient. Yet a cow's food is broken down and processed much more completely than a plant assimilates food into its tissues.

Regulations on Feeding Litter

In 1967, the Food and Drug Administration (FDA) discouraged the use of litter as a cattle feed. But in 1980, FDA issued a statement leaving it to the states to regulate this use. At least 22 states have current regulations. No state regulates the private use or exchange of litter for this purpose; many states, however, regulate this commodity on the commercial market.

Processed broiler litter offered for sale may be required to carry warning labels about the presence of any drugs that may be present in the litter. To minimize the potential for any drug residues in the cattle, all litter feeding should be discontinued at least 15 days before the animals are marketed for slaughter. This responsibility for selling only wholesome animals falls on the producers, regardless of regulations.

Generally, attention to safety precautions — such as the 15-day withdrawal period before slaughter, not feeding litter to lactating cows, and not feeding litter with high copper concentrations to copper-sensitive sheep — are sufficient to eliminate health risks. Litter has in fact been used as a feed ingredient for 35 years without any reported adverse effects on human or animal health.

Nutritional Value of Litter

The kind and amount of bedding material used in a broiler house and the number of batches housed on the litter affect the nutritional value of the litter, which should always be tested before being used as a food product for ruminants. The average nutrient contents are as follows:

- Moisture. The moisture content of the manure has little nutritional value; but litter that is too dry may be unpalatable, and litter that is too wet may be difficult to handle as a food ingredient. An acceptable range seems to be from 12 percent to 25 percent moisture.

- **Total Digestible Nutrients.** The sum of the crude protein and crude fiber values is used to calculate the total digestible nutrients (TDN) in the litter. If the litter has a calculated value of 50 percent TDN, it is comparable to hay as an energy source.

- **Crude Protein.** The average amount of crude protein in broiler litter is about 24.9 percent. But about 40 percent of that amount is probably nonprotein nitrogen or uric acid. Young cattle cannot use this nonprotein nitrogen as easily as mature cattle can, so broiler litter should be fed only to cattle weighing over 450 pounds.

- **Bound Nitrogen.** Insoluble or bound nitrogen occurs in litter that has been overheated. Bound nitrogen is less easily digested than other nitrogen. Average litter samples have 15 percent bound nitrogen; overheated litter may have as much as 50 percent bound nitrogen.

- **Crude Fiber.** The fiber source in litter comes mainly from the bedding materials. Ruminants, however, need long roughage, such as hay. At least 5 percent of the litter ration should be in the form of hay or other long roughage.

- **Minerals.** Excessive minerals in litter are not usually a problem, though excessive calcium can cause milk fever in beef cows at calving. Withdrawing the litter from the cows' food for 30 days overcomes this difficulty. Microminerals, such as copper, iron, and magnesium, are also present in large amounts. Copper should not be fed at more than 150 parts per million. It builds up in the liver but is usually not harmful.

- **Ash.** Ash content is an indication of litter quality and should not exceed 28 percent. About 12 percent of the ash is made up of calcium, phosphorus, potassium, and trace minerals; the rest is soil. Management techniques that reduce the soil content in the litter should be practiced.

Survey of Broiler Litter Composition

In some, all litter to be used as a beef ration should be analyzed — tested for nutrient content. Litter used for feed should have at least 18 percent crude protein and less than 28 percent ash. Not more than 25 percent of the crude protein should be bound or insoluble.

Litter that has too much ash is not suitable as a food ingredient. If broilers are reared on dirt floors, the litter may be contaminated with soil during cleanout.

The number of broods reared on the litter prior to cleanout of the broiler house also affects the quality of the litter; the more broods reared (five or more), the higher the litter is in nutrients.

Charred litter, that is, litter that has been exposed to too much heat during storage and has a burnt wood appearance, is only half as digestible as litter stored in stacks that were protected from excessive heat.

Processing and Storing Broiler Litter

All litter, regardless of its source, should be processed to eliminate pathogenic organisms, such as salmonella; pesticide residues; medicated poultry rations, such as antibiotics; coccidiostats; copper; and arsenic. Dead birds may not be composted with poultry litter if the litter is to be used as a feed ingredient.

Litter can be processed by fermentation (ensiled with other feed ingredients such as corn or sorghum), directly acidified, or heat treated. The easiest, most economical method of treatment is deep stacking. Deep stacking should be done for 20 days or more at a temperature of 130 °F. Most of the antibiotics approved for chickens are also approved for cows, and deep stacking inhibits molds (mycotoxins). Excessive heating to temperatures of 140 °F or more is cause for alarm. Therefore, the deep stack should be covered with a polyethylene tarp to exclude oxygen. Covered litter stacks will reach a temperature high enough to destroy pathogens but not so high that nitrogen digestibility is threatened.

Table 1.— Suggested Rations.

RATION NUMBER	1 DRY BROOD COW	2 LACTATING COW	3 STOCKERS
Ingredients	Pounds		
Broiler Litter	800	650	500
Cracked Corn	200	350	500
Total Pounds	1,000	1,000	1,000

Suggested Rations

Table 1 indicates rations that can be fed to dry brood cows, lactating cows, and stockers. These rations are recommended guidelines, not absolutes, since the nutrient levels in litter are variable. Vitamin A should be added to all rations. To reduce bloating, feed the animals Bovatec or Rumensin. Supplementing winter and summer grazing for stocker cattle increases the animals' weight gain and the total beef produced.

Summary

Because of the unique ability of ruminant animals to digest forages, other fibrous materials, and inorganic nitrogen such as urea, there is a growing awareness worldwide that by-products of agriculture can serve as low-cost alternative feed sources for these animals. The use of broiler litter may become more widespread as the need for economy and responsible waste management becomes more urgent. Alabama, for example, produces about 1.8 metric tons of litter per year; in fact, litter is the state's most collectible animal waste. Since management practices on the farm affect the litter's quality, attempts to market the litter as a feed ingredient begin with a focus on management techniques.

References

McCaskey, T.A., A.H. Stephenson, and B.G. Ruffin. 1990. Factors that Influence the Marketability and Use of Broiler litter as an Alternative Feed Ingredient. Pages 197-203 *in* Proceedings of the Sixth International Symposium on Agricultural and Food Processing Wastes. American Society of Agriculture Engineers, Chicago, IL.

Ruffin, B.G., and T.A. McCaskey. 1990. Feeding Broiler Litter to Beef Cattle. Circular ANR-557. Cooperative Extension Service, Auburn University, Auburn, AL.

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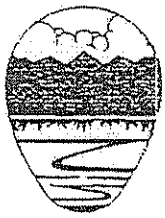


Horticultural Uses Of Litter

Because it has no unpleasant odors, composted broiler litter can be used indoors in a soilless potting medium. In fact, its nutrient content makes litter an ideal fertilizer for both indoor and outdoor gardens. It is also a good organic material for improving soil structure and drainage.

Soil Amendment

Gardeners can add composted litter to soils that otherwise contain too much sand or clay to support a garden. Work the top soil loose to a depth of 1 foot; then, spread 3 or 4 inches of compost on the soil. About 2 inches of compost may suffice at a minimum, but in really poor soils, 6 inches can be applied. Turn the soil over after the application to incorporate the compost.

Flower and Vegetable Transplants

Annual and perennial flowers and vegetable transplants also do well in compost-amended settings. Use a trowel to dig a hole in the new location. Remove the plant from its container and tear a hole in the bottom of the root-ball otherwise, the roots will continue to grow in a tight circle — before setting it into the ground. Fill the hole with amended soil and water thoroughly. Mulching will help the plants retain water, thereby conserving this resource as well.

Transplanting Trees and Shrubs

If you are transplanting trees or shrubs, use the techniques listed above, but make sure that the hole you dig for the plant is at least twice the size of its present container. Work about 3 to 6 inches of composted litter into the soil in the hole and place the tree or shrub therein. Keep as much soil as possible around the root-ball when you take it out of the container. Do, by all means, remove the container, especially if it is plastic, so that the new growth will have plenty of room. The soil line on your plant should be level with your garden. Fill in the hole with the amended soil, and water the plant thoroughly to remove any air pockets that may have been in the backfill.

Potting Mix for Indoor Plants

To make your own potting medium, use equal parts of composted litter and composted pine bark — all living things need nitrogen and carbon. The bark may be screened to remove large pieces (one-half inch or larger) before mixing. Fill the new pot with 1 or 2 inches of the planting medium, spread out the roots of your plant, and set it in the pot. Remove any buds or flowers before replanting to ensure that the plant has time to get properly established. Transplant from one pot size to the next one only; skip one size if you have to, but don't go from a 1-inch pot to a 4-inch pot and expect to succeed. Water the plants in the fall and winter; fertilize them in the growing seasons — spring and summer.

Lawns

Composted broiler litter is a superior product to use to establish new lawn areas. Spread about 2 inches of composted litter on the area to be seeded. Then turn the soil over to a depth of 6 inches to incorporate the material. Place turf on the prepared soil and water it as usual. The addition of compost to the soil helps hold moisture and improves drainage.

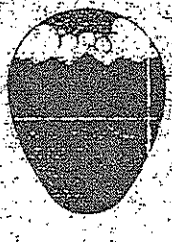
Fertilizer

The nutritional analysis of composted litter will vary, depending on conditions of waste production and handling, among other variables. However, most composted litter will have an analysis similar to 2-2-2 commercial fertilizer. That is, it should have no less than 2 percent nitrogen (N), 2 percent phosphorus acid (P_2O_5), and no less than 2 percent potassium (K_2O). Two pounds of broiler litter compost can be applied monthly to your vegetable and flowering plants. It should be worked into the soil lightly at the drip line or where the water falls naturally from the leaves.

References

[illegible]

RESOURCE INFORMATION



Poultry Water Quality Consortium

The poultry industry and three government agencies have formed the Poultry Water Quality Consortium to promote better environmental management by the rapidly growing poultry industry.

The Consortium encourages the use of poultry by-products as a resource rather than letting them become a pollution source. As the industry grows, protecting natural resources is becoming a major priority, demanding new technologies in poultry by-product development, storage, utilization, and land application.

The Consortium is responding to this challenge by promoting cooperation and information exchanges between government and industry on water quality and by-product utilization issues. By focusing on pollution prevention, the Consortium encourages the development and transfer of new technologies designed to protect water quality and promote a clean environment.

Members of the Consortium:

- Southeastern Poultry & Egg Association
- U.S. Department of Agriculture – Soil Conservation Service
- Tennessee Valley Authority
- U.S. Environmental Protection Agency

Contact

Ed Schwille, Liaison
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Other pages in this handbook contain more detailed information on these subjects. Permission is hereby granted to producers, growers, and associations serving the poultry industry to reproduce this material for further distribution. The Poultry Water Quality Consortium is a cooperative effort of industry and government to identify and adopt prudent uses of poultry by-products that will preserve the quality of water for everyone.

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Southeastern Poultry and Egg Association

The Southeastern Poultry and Egg Association (Southeastern) is dedicated to the growth and development of the poultry industry and represents the entire industry — from the producers of eggs, broilers, and turkeys, to the processors of poultry and egg products, along with the allied companies that serve the industry. The association emphasizes technology transfer, in order to ensure that knowledge and information are exchanged and shared. The association's extensive and diverse programs have been developed to help members keep abreast of rapid changes in the poultry and egg industry.

Services Available to Poultry Growers

Southeastern is best known for its annual International Poultry Exposition, held in January in Atlanta, Georgia. The Expo features the world's largest display of technology, equipment, and supplies used to produce and process poultry and egg products.

Continuing education is a high priority. The association's seminar program has expanded into a comprehensive schedule of workshops and clinics to keep the poultry industry informed. Twelve seminars are held each year.

Through its government relations program, Southeastern keeps Congress and federal agencies apprised of industry needs, and informs members of government actions.

The association's research program returns millions of dollars to the industry. Research grants are used to find better ways of producing poultry and egg products. Members are kept aware of industry developments through the distribution of newsletters, reports, and memos.

Contact

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U.S. Department of Agriculture
Soil Conservation Service

Agency's Commitment to the Poultry Industry

The Soil Conservation Service (SCS), an agency within the U.S. Department of Agriculture (USDA), administers national soil and water conservation programs with the cooperation of landowners and operators in local soil conservation districts and other government agencies. It provides USDA leadership to assist landowners and local groups to practice resource conservation. In this role, it protects and enhances the nation's surface and groundwater resources and provides technical assistance to the U.S. agricultural community to help plan, design, and implement waste management systems and other conservation projects. The 1990 Farm Bill focused the SCS on major agricultural concerns including pesticides, nutrients, animal waste, and agricultural pollutants in surface and groundwater.

Services Available to Poultry Growers

Through its conservation practices, the SCS provides planning, design, and construction assistance on waste treatment lagoons, manure and litter dry-stacking facilities, poultry mortality facilities, management, and nutrient management plans based on soils, crops, and equipment availability. It also serves as technical representative for USDA cost-share programs to implement nutrient and poultry mortality management systems; and, in some cases, provides financial as well as technical assistance in special project areas. The SCS works closely with state regulatory agencies in waste management.

Contact

For more information about SCS programs and assistance, call or visit the SCS office listed in your local telephone directory under U.S. Department of Agriculture.

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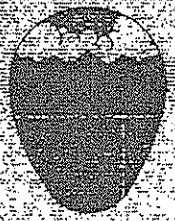

Tennessee Valley Authority

Agency's Commitment to the Poultry Industry

An overall objective of the Tennessee Valley Authority (TVA) is to develop and implement programs and activities that will further develop agriculture and agribusiness to protect the environment. The poultry industry is an integral part of the agricultural economy. Protecting water quality is a major concern as illustrated by TVA's ongoing projects related to proper management and use of animal wastes.

Much of TVA's work is accomplished in cooperation with federal and state agencies, and universities and private organizations concerned with animal waste management. TVA is in an excellent position to identify, demonstrate, and transfer poultry by-product resources technology to potential users.

Services Available to Poultry Growers

TVA's programs and projects primarily deal with helping prevent or reduce impacts of the industry on the environment. This service is accomplished through educational workshops and demonstrations in cooperation with other federal and state agencies to focus on preventing or reducing the environmental impacts of by-products generated by the poultry industry.

Current project areas are composting poultry mortality; animal waste lagoon management; production and marketing of poultry litter products for use as a soil amendment, fertilizer, and cattle feed; creating agribusiness that will produce and market poultry by-products; and conducting research and demonstrations that show correct use of by-products.

Contacts

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Richard D. Urban
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Larry Johnson
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Tennessee Valley Authority, CTR 2L
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U.S. Environmental Protection Agency

Agency's Commitment to the Poultry Industry

The U.S. Environmental Protection Agency (EPA) is dedicated to improving and preserving the quality of the environment, both national and global, and to preventing and reducing water pollution associated with poultry by products. Historically, EPA has distinguished between point and nonpoint sources of water pollution in its management programs. Under the Clean Water Act, certain poultry processing or rendering plants are regulated and required to remove pollutants from process wastewater.

Certain large concentrated animal feeding operations (CAFOs) may be regulated and may be required to obtain a discharge permit. The new Coastal Zone Act Reauthorization Amendments of 1990 address nonpoint source pollution affecting coastal waters. This Coastal Zone Act requires EPA to issue guidance on nonpoint source management measures that represent the best available means of reducing nonpoint source pollution in coastal waters.

Services Available to Poultry Growers

EPA administers a variety of nonpoint source control programs to address animal waste problems associated with smaller operations. Under section 319 of the Clean Water Act, states have developed nonpoint source assessment reports on the nature and extent of their nonpoint pollution problems, including problems associated with poultry waste. In addition, section 319 requires states to develop comprehensive management programs to mitigate the problems.

Currently, funds are provided under 319(h) to states to implement their nonpoint source management programs including, for example, demonstrations of poultry composting facilities or development of educational manuals or regulations to address poultry by-products. EPA provides assistance to states to implement nonpoint source controls under other programs such as the Chesapeake Bay Program and the Clean Lakes Program.

Contacts

The U.S. Environmental Protection Agency, headquartered in Washington, DC, operates 10 regional offices.

U.S. EPA, Region 1
(CT, MA, ME, NH, RI, VT)
John F. Kennedy Federal Building
One Congress Street
Boston, MA 02203
(617) 565-3515

U.S. EPA, Region 2
(NJ, NY, PR, VI)
Water Standards and Planning Branch
26 Federal Plaza
New York City, NY 10278
(212) 264-8708

U.S. EPA, Region 3
(DC, DE, MD, PA, VA, WV)
841 Chestnut Street
Philadelphia, PA 19107
(215) 597-3429

U.S. EPA, Region 4
(AL, FL, GA, KY, MS, NC, SC, TN)
345 Courtland Street, NE
Atlanta, GA 30365
(404) 347-2126

RESOURCE INFORMATION

U.S. EPA, Region 5
(IL, IN, MI, MN, OH, WI)
Great Lakes National Program
77 W. Jackson Boulevard
Chicago, IL [illegible]
(312) [illegible]

U.S. EPA, Region 6
(AR, LA, NM, OK, TX)
1445 Ross Avenue, 12th Floor
Dallas, TX 75202-2733
(214) [illegible]

U.S. EPA, Region 7
(IA, KS, MO, NE)
726 Minnesota Avenue
Kansas City, KS 66101
(913) 551-[illegible]

U.S. EPA, Region 8
(CO, MT, ND, SD, UT, WY)
999 18th Street, Suite 500
Denver, CO 80202-[illegible]
(303) 293-[illegible]

U.S. EPA, Region 9
[illegible]
75 Hawthorne Street
San Francisco, CA [illegible]
[illegible]

U.S. EPA, Region 10
[illegible]
1200 Sixth Avenue
Seattle, WA [illegible]
(206) [illegible]

U.S. EPA, Headquarters
Office of Water
401 M Street SW
Washington, DC [illegible]
(202) [illegible]

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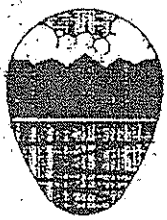

DIRECTORY OF POULTRY ASSOCIATIONS

STATE, REGIONAL, AND NATIONAL

The following state, regional, and national organizations are listed in alphabetical order. The organizations in most states are therefore listed together; however, if you are looking for a particular association, please consult the entire list. The Wilkes Area Poultry Association, for example, is listed under W, not under North Carolina. We hope that we have not inadvertently omitted or incorrectly identified any organization or its address. This material will be updated from time to time.

ALABAMA POULTRY & EGG ASSOCIATION
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Montgomery, AL 36104
TEL: (205) 265-2732
FAX: (205) 265-0008

ALASKA DIVISION OF AGRICULTURE
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FAX: (907) 745-7112

AMERICAN EGG BOARD
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FAX: (708) 296-7007

AMERICAN POULTRY ASSOCIATION
26363 South Tucker Road
Estacada, OR 97023
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ARIZONA POULTRY IMPROVEMENT BOARD
Agricultural Science Building, Room 328
University of Arizona
Tucson, AZ 85721
TEL: (602) 621-1095

ARIZONA POULTRY FEDERATION
c/o Hickman's Egg Ranch
7403 North 91st Avenue
Glendale, AZ 85305
TEL: (602) 872-1120
FAX: (602) 872-9220

ARKANSAS POULTRY FEDERATION
P.O. Box 1446
Little Rock, AR 72203-1446
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FAX: (501) 375-5519

CALIFORNIA EGG COMMISSION
1150 North Mountain Avenue, Suite 114
Upland, CA 91786
TEL: (714) 981-4923
FAX: (714) 946-5563

CALIFORNIA POULTRY INDUSTRY FEDERATION
3117 A McHenry Avenue
Modesto, CA 95350
TEL: (209) 576-6355
FAX: (209) 576-6119

COLORADO POULTRY IMPROVEMENT BOARD
4816 E Co Road, #30
Ft Collins, CO 80525
TEL: (303) 226-3680

CONNECTICUT POULTRY ASSOCIATION
Department of Agriculture
16 South Capitol Avenue
Hartford, CT 06106
TEL: (203) 566-5268
FAX: (203) 566-6576

DELAWARE POULTRY IMPROVEMENT ASSOCIATION
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Georgetown, DE 19947
TEL: (302) 856-7303

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FLORIDA POULTRY FEDERATION
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FAX: (813) 620-4008

GEORGIA EGG ASSOCIATION AND COMMISSION
16 Forest Parkway
Forest Park, GA 30050
TEL: (404) 363-7661
FAX: (404) 363-7664

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Gainesville, GA 30503-0763
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FAX: (404) 532-7543

GEORGIA POULTRY IMPROVEMENT ASSOCIATION
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TEL: (404) 535-5996
FAX: (404) 539-1948

GEORGIA TURKEY ASSOCIATION
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Watkinsville, GA 30677-0127
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HAWAII FRYER COUNCIL
1818 Kanakanui Street
Honolulu, HI 96819
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HAWAII EGG PRODUCERS ASSOCIATION
841 Bishop Street, Suite 850
Honolulu, HI 96813
TEL: (808) 522-5133
FAX: (808) 522-5144

IDAHO POULTRY INDUSTRY FEDERATION
c/o Merrill Poultry Farms Inc
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Paul, ID 83347
TEL: (208) 438-4605
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ILLINOIS POULTRY INDUSTRY COUNCIL
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ILLINOIS STATE TURKEY GROWERS ASSOCIATION
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INDIANA STATE POULTRY ASSOCIATION
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TEL: (515) 232-7787
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KANSAS POULTRY ASSOCIATION AND KANSAS TURKEY FEDERATION
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KENTUCKY POULTRY IMPROVEMENT ASSOCIATION
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FAX: (404) 476-9762

TENNESSEE EGG & POULTRY ASSOCIATION
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FAX: (615) 974-7448

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TEXAS POULTRY FEDERATION
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FAX: (512) 454-4221

UNITED EGG ASSOCIATION
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Washington, DC 20001
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FAX: (202) 408-7763

UNITED EGG PRODUCERS
1303 Hightower Trail, Suite 200
Atlanta, GA 30350
TEL: (404) 587-8571
FAX: (404) 587-0041

USA POULTRY & EGG EXPORT COUNCIL
2300 West Park Place Boulevard, Suite 100
Stone Mountain, GA 30087
TEL: (404) 413-0006
FAX: (404) 413-0007

UTAH TURKEY MARKETING BOARD
P.O. Box 408
Moroni, UT 84646-0408
TEL: (801) 436-8365
FAX: (801) 436-8280

VERMONT POULTRY IMPROVEMENT BOARD
Vermont Department of Agriculture, Food and Markets
120 State Street
Montpelier, VT 05620
TEL: (802) 828-2500
FAX: (802) 828-2361

VIRGINIA EGG COUNCIL, INC.
911 Saddleback Court
McLean, VA 22102
TEL: (703) 790-1984

VIRGINIA POULTRY FEDERATION
P.O. Box 552
Harrisonburg, VA 22801
TEL: (703) 433-2451
FAX: (703) 433-3256

WASHINGTON POULTRY INDUSTRY ASSOCIATION
1605 Fifth Street, S.W.
Puyallup, WA 98371
TEL: (206) 840-2040

WASHINGTON POULTRY IMPROVEMENT ASSOCIATION
c/o Washington State University
Puyallup Center
Puyallup, WA 98371
TEL: (206) 840-4537

WEST COAST UNITED EGG PRODUCERS
P.O. Box 1526
Rancho Cucamonga, CA 91729-1526
TEL: (909) 980-5114
FAX: (909) 945-3575

WEST VIRGINIA POULTRY ASSOCIATION
P.O. Box 612
Moorefield, WV 26836-0612
TEL: (304) 538-2725

WILKES AREA POULTRY ASSOCIATION
P.O. Box 1393
North Wilkesboro, NC 28659
TEL: (704) 872-6227
FAX: (704) 872-1452

WISCONSIN POULTRY IMPROVEMENT ASSOCIATION
260 Animal Science Building
1675 Observatory Drive
Madison, WI 53706
TEL: (608) 262-9764
FAX: (608) 262-6005

RESOURCE INFORMATION

POULTRY INDUSTRIES OF LOUISIANA, INC.
Louisiana State University
Extension Service
221 Knapp Hall
Baton Rouge, LA 70803
TEL: (504) 388-8667
FAX: (504) 388-2478

MAINE POULTRY FEDERATION
P.O. Box 228
Augusta, ME 04330-0228
TEL: (207) 622-4443
FAX: (207) 623-3748

MARYLAND EGG COUNCIL, INC.
3109 Animal Science Center
University of Maryland
College Park, MD 20742
TEL: (301) 405-5775
FAX: (301) 314-9557

MASSACHUSETTS POULTRY ASSOCIATION
22 Kimball Place
Fitchburg, MA 01420
TEL: (508) 345-4103
FAX: (508) 345-7187

MICHIGAN ALLIED POULTRY INDUSTRY, INC.
P.O. Box 153
Stevensville, MI 49127-0153
TEL: (616) 465-5531
FAX: (616) 465-4730

MIDWEST POULTRY FEDERATION AND MINNESOTA TURKEY GROWERS ASSOCIATION
2380 Wycliff Street
St Paul, MN 55114
TEL: (612) 646-4553
FAX: (612) 646-4554

MIDWEST UNITED EGG PRODUCERS
P.O. Box 170
124 North Second Street
Eldridge, IA 52748
TEL: (319) 285-9100
FAX: (319) 285-9109

MISSISSIPPI POULTRY ASSOCIATION, INC.
P.O. Box 13309
Jackson, MS 39236-3309
TEL: (601) 355-0248
FAX: (601) 353-3840

MISSOURI POULTRY FEDERATION
2100 East Broadway, Room 319
Columbia, MO 65201
TEL: (314) 874-1920
FAX: (314) 874-1921

NATIONAL BROILER COUNCIL
The Madison Building, Suite 614
1155 15th Street, N.W.
Washington, DC 20005
TEL: (202) 296-2622
FAX: (202) 293-4005

NATIONAL GOOSE COUNCIL, INC.
7 Oak Street West
P.O. Box 267
Sisseton, SD 57262-0267
TEL: (605) 698-7651

NATIONAL INDEPENDENT POULTRY AND FOOD DISTRIBUTORS ASSOCIATION
604 Green Street, Suite 3
Gainesville, GA 30501
TEL: (404) 535-9901
FAX: (404) 535-7385

NATIONAL RENDERERS ASSOCIATION, INC.
1101 Connecticut Avenue, N.W., Suite 100
Washington, DC 20036
TEL: (202) 857-1136
FAX: (202)775-2625

NATIONAL TURKEY FEDERATION
11319 Sunset Hills Road
Reston, VA 22090
TEL: (703) 435-7206
FAX: (703) 481-0837

NEBRASKA POULTRY IMPROVEMENT ASSOCIATION
A 103 Animal Sciences
P.O. Box 830908
University of Nebraska
Lincoln, NE 68583-0908
TEL: (402) 472-2051
FAX: (402) 472-6362

NEW ENGLAND POULTRY ASSOCIATION
P.O. Box 725
Augusta, ME 04330
TEL: (207) 623-3940
FAX: (207) 623-3748

NEW HAMPSHIRE POULTRY GROWERS ASSOCIATION
20 Goodhue Road
Boscawen, NH 03303
TEL: (603) 796-2890

NEW YORK STATE POULTRY COORDINATED EFFORT, INC.
26 York Ave
Saratoga Springs, NY 12866
TEL: (518) 584-5912

RESOURCE INFORMATION

NORTH CAROLINA EGG ASSOCIATION
1213 Ridge Road
Raleigh, NC 27607
TEL: (919) 828-8188
FAX: (919) 828-8189

NORTH CAROLINA POULTRY FEDERATION AND TURKEY FEDERATION
4020 Barrett Drive, Suite 102
Raleigh, NC 27609
TEL: (919) 783-8218
FAX: (919) 783-8220

NORTH DAKOTA TURKEY FEDERATION
North Dakota State University
Animal Science Department
Fargo, ND 58105
TEL: (701) 237-7691

NORTHEAST UNITED EGG PRODUCERS
808 17th Street, N.W., Suite 200
Washington, DC 20006
TEL: (202) 296-8248
FAX: (202) 223-9569

NORTHWEST EGG PRODUCERS COOPERATIVE ASSOCIATION
P.O. Box 1038
3700 Cooper Point Road, S.W.
Suite B-3
Olympia, WA 98507-1038
TEL: (206) 754-4401
FAX: (206) 754-4414

OHIO POULTRY ASSOCIATION
674 West Lane Avenue
Columbus, OH 43210
TEL: (614) 292-2089
FAX: (614) 292-7227

OKLAHOMA EGG COUNCIL
201 Animal Science Building
Stillwater, OK 74078
TEL: (405) 744-6058
FAX: (405) 744-5339

OKLAHOMA STATE POULTRY FEDERATION
P.O. Box 357
Hartshorne, OK 74547
TEL: (918) 297-7219

OREGON BROILER GROWERS ASSOCIATION
762 Driftwood Drive
Eugene, OR 97402
TEL: (503) 829-9682

OREGON POULTRY COUNCIL
32914 South Highway 213
Molalla, OR 97038
TEL: (503)829-9682

OREGON POULTRY INDUSTRIES ASSOCIATION
P.O. Box 3003
Portland, OR 97208-3003
TEL: (503) 777-1320
FAX: (503) 777-2373

OREGON TURKEY IMPROVEMENT ASSOCIATION
5705 Cooper Hollow Road
Monmouth, OR 97361
TEL: (503) 623-3722

OREGON TURKEY GROWERS
P.O. Box 5324
Salem, OR 97302
TEL: (503) 364-3323
FAX: (503) 364-6142

PACIFIC EGG AND POULTRY ASSOCIATION
1620 North Carpenter Road
Building A-4
Modesto, CA 95351
TEL: (209) 524-9666
FAX: (209) 524-3047

PENNSYLVANIA POULTRY FEDERATION
500 North Progress Avenue
Harrisburg, PA 17109
TEL: (717) 652-7530
FAX: (717) 652-0230

POULTRY PRODUCERS OF RHODE ISLAND
49 Hillsdale Road
West Kingston, RI 02892
TEL: (401) 792-2072
FAX: (401) 792-4017

SOUTH CAROLINA POULTRY FEDERATION
1201 Main Street, Suite 1220
AT&T Building
Columbia, SC 29201
TEL: (803) 748-1283
FAX: (803) 748-1294

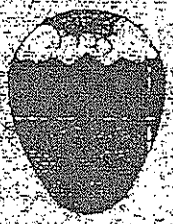
SOUTH CAROLINA TURKEY FEDERATION
930 Hawthorne Lane Ext
Rock Hill, SC 29730
TEL: (803) 327-6037

SOUTH DAKOTA POULTRY INDUSTRY
P.O. Box 2170
South Dakota State University
Brookings, SD 57007
TEL: (605) 688-5165
FAX: (605) 688-6170

Other pages in this handbook contain more detailed information on these subjects. Permission is hereby granted to producers, growers, and associations serving the poultry industry to reproduce this material for further distribution. The Poultry Water Quality Consortium is a cooperative effort of industry and government to identify and adopt prudent uses of poultry by-products that will preserve the quality of water for everyone.

RI / 6 – 6/94

POULTRY WATER QUALITY CONSORTIUM
HB-2C, 1101 Market Street • Chattanooga, TN 37402-2801
Tel: (615) 751-7267 • Fax: (615) 751-7479



Other Supporting USDA Agencies

Agricultural Stabilization and Conservation Service

The USDA's Agricultural Stabilization and Conservation Service (ASCS) helps to assure a continuous supply of food and fiber for all Americans, and to promote sound resource management systems. As part of this mandate, ASCS works with poultry producers to share the costs of solving erosion and water quality problems that result from nonpoint source pollution. The cost-sharing program is called the Agricultural Conservation Program, or ACP.

Services Available to Growers

Under the ACP, ASCS has the authority to share with producers up to 60 percent of the cost of building facilities that handle and/or store poultry waste. Facilities include lagoons, dry stacks, and composting units. Producers who have been in business for less than five years or who have substantially enlarged their operations may not be eligible for this assistance.

Contact

For more information about ACP and other ASCS programs, call or visit the ASCS office listed in your telephone directory.

Cooperative Extension Service

The Extension Service, U.S. Department of Agriculture (ES-USDA) and the state Cooperative Extension System (CES) link research-based information and technology to help people improve their lives through an educational process that uses scientific knowledge focused on issues and needs. Cooperative Extension, created by the Smith-Lever Act in 1914, was designed as a partnership of the USDA and the land-grant universities that were established under the Morrill Acts of 1862 and 1890.

USDA and state and local agencies form a network of Extension professionals throughout the United States and its territories. Offices are located in more than 3,150 counties across the nation, with technical and administrative suppport for county agents located at state and land-grant universities.

Services Available to Growers

Educational programs to protect natural resources and the environment, to manage waste efficiently, and to deal with water quality are included in the national priority initiatives of the Cooperative Extension System.

Contact

For more information about ES-USDA and the Cooperative Extension System, call or visit the CES office listed in your telephone directory under local government.

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POULTRY WATER QUALITY CONSORTIUM
HB-2C, 1101 Market Street • Chattanooga, TN 37402-2801
Tel: (615) 751-7297 • Fax: (615) 751-7479

DIRECTORY OF STATE WATER QUALITY AGENCIES

ALABAMA SOIL AND WATER CONSERVATION COMMITTEE
2800 Zelda Road
Suite 200-9 and 200-10
Montgomery, AL 36106-2686
TEL: (205) 242-2620

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
1751 Cong. W. L. Dickinson Drive
Montgomery, AL 36109
TEL: (205) 271-7700

ALASKA DEPARTMENT OF NATURAL RESOURCES
P.O. Box 949
Palmer, AK 99645-0949
TEL: (907) 745-7200

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
P.O. Box 0
410 Willoughby Avenue, Suite 105
Juneau, AK 99801-1795
TEL: (907) 465-5000

ARIZONA SOIL AND WATER CONSERVATION AGENCY
Natural Resource Conservation Division
1616 West Adams, Room 419
Phoenix, AZ 85007
TEL: (602) 542-4625

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
3033 N. Central Avenue
Phoenix, AZ 85012
TEL: (602) 207-4512

ARKANSAS SOIL AND WATER CONSERVATION COMMISSION
101 E. Capitol
Suite 350
Little Rock, AR 72201
TEL: (501) 682-1611

CALIFORNIA SOIL AND WATER CONSERVATION AGENCY
Resources Control Board
Division of Water Quality
901 P Street
Sacramento, CA 95801
TEL: (916) 657-1727

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD
P.O. Box 100
Sacramento, CA 95812
TEL: (916) 657-2390

COLORADO STATE SOIL CONSERVATION BOARD
1313 Sherman Street
Room 219
Denver, CO 80203
TEL: (303) 866-3351

COLORADO WATER QUALITY AGENCY
Water Quality Control Division
4300 Cherry Creek South
Denver, CO 80222-1530
TEL: (303) 692-3500

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
79 Elm Street
P.O. Box 5066
Hartford, CT 06102-5066
TEL: (203) 566-7049

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL
89 Kings Highway, Box 1401
Dover, DE 19903
TEL: (302) 739-4860

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
2600 Blair Stone Road
Tallahassee, FL 32399-2400
TEL: (904) 488-4805

RESOURCE INFORMATION

GEORGIA STATE SOIL AND WATER CONSERVATION COMMISSION
P.O. Box 8024
Athens, GA 30603
TEL: (706) 542-3065

GEORGIA WATER QUALITY MANAGEMENT PROGRAM
7 Martin Luther King Drive
Suite 643
Atlanta, GA 30334
TEL: (404) 656-4988

HAWAII DIVISION OF WATER RESOURCE MANAGEMENT
P.O. Box 621
Honolulu, HI 96809
TEL: (808) 587-0214

HAWAII DIVISION OF ENVIRONMENTAL PLANNING
5 Waterfront Plaza
Suite 25D
500 Ala Moana Boulevard
Honolulu, HI 96801-9984
TEL: (808) 543-8337

IDAHO SOIL CONSERVATION COMMISSION
1215 W. State Street
Boise, ID 83720-7000
TEL: (208) 334-0210

IDAHO DIVISION OF ENVIRONMENTAL QUALITY
1410 N. Hilton
Boise, ID 83706
TEL: (208) 334-5860

ILLINOIS DEPARTMENT OF AGRICULTURE
P.O. Box 19281
State Fairgrounds
Springfield, IL 62794
TEL: (217) 782-6297

ILLINOIS DIVISION OF WATER POLLUTION CONTROL
Box 19276
2200 Churchill Road
Springfield, IL 62794
TEL: (217) 782-3362

INDIANA DEPARTMENT OF NATURAL RESOURCES
Division of Soil Conservation
402 W. Washington Street, Room 265W
Indianapolis, IN 46204
TEL: (317) 233-3870

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
105 S. Meridian Street
P.O. Box 6015
Indianapolis, IN 46206-6015
TEL: (317) 232-8603

IOWA DIVISION OF SOIL CONSERVATION
Wallace State Office Building
Des Moines, IA 50319
TEL: (515) 281-6143

IOWA DEPARTMENT OF NATURAL RESOURCES
Water Quality Planning Division
East 9th and Grand Avenue
Des Moines, IA 50319-0034
TEL: (515) 281-5145

KANSAS STATE CONSERVATION COMMISSION
109 S.W. Ninth Street
Suite 500
Topeka, KS 66612-1299
TEL: (913) 296-3600

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Landon State Office Building
Room 901
Topeka, KS 66612-1290
TEL: (913) 296-1522

KENTUCKY SOIL AND WATER CONSERVATION COMMISSION
691 Teton Trail
Frankfort, KY 40601
TEL: (502) 564-3080

KENTUCKY DIVISION OF WATER – NONPOINT SOURCES
14 Reilly Road
Frankfort, KY 40601
TEL: (502) 564-3410

LOUISIANA DEPARTMENT OF AGRICULTURE AND FORESTRY
Office of Soil and Water Conservation
P.O. Box 3554
Baton Rouge, LA 70821-3554
TEL: (504) 922-1270

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY
P.O. Box 82263
Baton Rouge, LA 70884-2263
TEL: (504) 765-0741

RESOURCE INFORMATION

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
Water Quality Management
P.O. Box 2063
Harrisburg, PA 17105-2063
TEL: (717) 783-8303

PUERTO RICO SOIL CONSERVATION COMMITTEE
Department of Agriculture
P.O. Box 10163
Santurce, PR 00908-1163
TEL: (809) 721-2120

PUERTO RICO ENVIRONMENTAL QUALITY BOARD
1413 Fernandez Juncos Avenue
Santurce, PR 00909
TEL: (809) 729-6920

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
291 Promenade Street
Providence, RI 02908
TEL: (401) 277-3961

SOUTH CAROLINA LAND RESOURCES CONSERVATION COMMISSION
2221 Devine Street
Suite 222
Columbia, SC 29205
TEL: (803) 734-9100

SOUTH CAROLINA BUREAU OF WATER POLLUTION CONTROL
2600 Bull Street
Columbia, SC 29201
TEL: (803) 734-5228

SOUTH DAKOTA DEPARTMENT OF AGRICULTURE
Division of Conservation
445 East Capitol
Pierre, SD 57501-3185
TEL: (605) 773-3258

SOUTH DAKOTA DIVISION OF WATER RESOURCE MANAGEMENT
523 E. Capitol
Pierre, SD 57501
TEL: (605) 773-4216

TENNESSEE STATE DEPARTMENT OF AGRICULTURE
Agriculture Resource Division
Ellington Center
P.O. Box 40627
Nashville, TN 37204
TEL: (615) 360-0108

TENNESSEE DEPARTMENT OF CONSERVATION AND ENVIRONMENT
401 Church Street
6th Floor L & C Annex
Nashville, TN 37243-1534
TEL: (615) 532-0625

TEXAS STATE SOIL AND WATER CONSERVATION BOARD
P.O. Box 658
Temple, TX 76503
TEL: (817) 773-2250

UTAH STATE SOIL CONSERVATION COMMISSION
Department of Agriculture
350 North Redwood Road
Salt Lake City, UT 84116
TEL: (801) 538-7171

UTAH DIVISION OF WATER QUALITY
288 N. 1460 West
Salt Lake City, UT 84114-4870
TEL: (801) 538-6146

VERMONT NATURAL RESOURCES CONSERVATION COMMISSION
103 South Main Street
Waterbury, VT 05671-0301
TEL: (802) 241-3601

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Agency of Natural Resources
Building 10 North
103 South Main Street, 2nd Floor
Waterbury, VT 05671-0408
TEL: (802) 241-3770

VIRGIN ISLANDS ECONOMIC DEVELOPMENT AND AGRICULTURE
Estate Lower Love
Kingshill, VI 00850
TEL: (809) 778-0997

VIRGIN ISLANDS DIVISION OF ENVIRONMENTAL PROTECTION
45A Estate Nisky Center, Suite 231
St. Thomas, VI 00802
TEL: (809) 774-3320

VIRGIN ISLANDS DEPARTMENT OF PLANNING AND NATURAL RESOURCES
Nisky Center, Suite 231
St. Thomas, VI 00802
TEL: (809) 774-3320

VIRGINIA DIVISION OF SOIL AND WATER CONSERVATION
203 Governor Street, Suite 206
Richmond, VA 23219
TEL: (804) 786-2064

RESOURCE INFORMATION

MAINE SOIL AND WATER CONSERVATION COMMISSION
Maine Department of Agriculture, Food, and Rural Resources
State House Station 28
Augusta, ME 04333
TEL: (207) 289-2666

MAINE BUREAU OF WATER QUALITY CONTROL
Department of Environmental Protection Agency
State House, Number 17
Augusta, ME 04333
TEL: (207) 289-3901

MARYLAND STATE SOIL AND WATER CONSERVATION COMMITTEE
Maryland Department of Agriculture
Annapolis, MD 21401
TEL: (410) 841-5863

MARYLAND DEPARTMENT OF THE ENVIRONMENT
Watershed Management Administration
2500 Broening Highway
Baltimore, MD 21224
TEL: (301) 631-3552

MASSACHUSETTS STATE COMMISSION FOR THE CONSERVATION OF SOIL
100 Cambridge Street
20th Floor
Boston, MA 02202
TEL: (617) 727-1552

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
1 Winter Street
Boston, MA 02108
TEL: (617) 727-0437

MICHIGAN DEPARTMENT OF AGRICULTURE
P.O. Box 30017
Lansing, MI 48909
TEL: (517) 373-9797

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
Surface Water Quality Division
P.O. Box 30273
Lansing, MI 48909
TEL: (517) 373-2867

MINNESOTA BOARD OF WATER AND SOIL RESOURCES
155 South Wabasha Street, Suite 104
St Paul, MN 55107
TEL: (612) 296-3767

MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road
St. Paul, MN 55155
TEL: (612) 296-6300

MISSISSIPPI SOIL AND WATER CONSERVATION COMMISSION
P.O. Box 23005
Jackson, MS 39225-3005
TEL: (601) 359-1281

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
P.O. Box 10385
Jackson, MS 39289-0385
TEL: (601) 961-5171

MISSOURI DEPARTMENT OF NATURAL RESOURCES
P.O. Box 176
Jefferson City, MO 65102
TEL: (314) 751-4810

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
P.O. Box 202301
Helena, MT 59620-2301
TEL: (406) 444-6667

MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
Cogswell Building
Room A-206
Helena, MT 59620-0909
TEL: (406) 444-2406

NEBRASKA NATURAL RESOURCE COMMISSION
301 Centennial Mall South
P.O. Box 94876
Lincoln, NE 68509-4876
TEL: (402) 471-2081

NEBRASKA DEPARTMENT OF ENVIRONMENTAL CONTROL
P.O. Box 98922
Lincoln, NE 68509
TEL: (402) 471-4220

NEVADA STATE DIVISION OF CONSERVATION DISTRICTS
333 W. Nye Lane, Room 126
Carson City, NV 89710
TEL: (702) 687-6977

NEVADA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
Capitol Complex
333 W. Nye Lane
Carson City, NV 89710
TEL: (702) 687-4670

RESOURCE INFORMATION

NEW HAMPSHIRE DEPARTMENT OF AGRICULTURE
P.O. Box 2042
Concord, NH 03302-2042
TEL: (603) 271-3551

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
P.O. Box 95
6 Hazen Drive
Concord, NH 03302-0095
TEL: (603) 271-3503

NEW JERSEY STATE SOIL CONSERVATION COMMITTEE
New Jersey Department of Agriculture
CN 330, Room 204
Trenton, NJ 08625
TEL: (609) 292-5540

NEW JERSEY BUREAU OF WATER QUALITY PLANNING
401 East State Street, CN 423
Trenton, NJ 08625-0423
TEL: (609) 633-7021

NEW MEXICO SOIL AND WATER CONSERVATION BUREAU
Energy and Forestry Resource Conservation
P.O. Box 1948
Santa Fe, NM 87504-1948
TEL: (505) 827-5830

NEW MEXICO ENVIRONMENTAL DEPARTMENT
NMED/Purchase Water Quality Bureau
P.O. Box 26110
Santa Fe, NM 87502
TEL: (505) 827-0187

NEW YORK STATE DEPARTMENT OF SOIL AND WATER CONSERVATION
1 Winners Circle
Albany, NY 12235
TEL: (518) 457-3738

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Room 306
Albany, NY 12233-3500
TEL: (518) 457-6674

NORTH CAROLINA DIVISION OF SOIL AND WATER CONSERVATION
Department of EHNR
Box 27687
Raleigh, NC 27611-7687
TEL: (919) 733-2302

NORTH CAROLINA DEPARTMENT OF HEALTH AND NATURAL RESOURCES
Division of Environmental Management
P.O. Box 27687
Raleigh, NC 27611
TEL: (919) 733-4064

NORTH DAKOTA STATE SOIL CONSERVATION COMMITTEE
State Capitol
600 East Boulevard Avenue
Bismarck, ND 58505-0790
TEL: (701) 224-2650

NORTH DAKOTA DEPARTMENT OF HEALTH AND CONSOLIDATED LABS
1200 Missouri Avenue
Box 5520
Bismarck, ND 58502-5520
TEL: (701) 221-5210

OHIO DEPARTMENT OF NATURAL RESOURCES
Soil and Water Conservation District
1939 Fountain Square Court
Building E-2
Columbus, OH 43224
TEL: (614) 265-6637

OHIO ENVIRONMENTAL PROTECTION AGENCY
1800 Watermark Drive
Columbus, OH 43215
TEL: (614) 644-3020

OKLAHOMA CONSERVATION COMMISSION
2800 N. Lincoln Boulevard
Suite 160
Oklahoma City, OK 73105
TEL: (405) 521-2384

OKLAHOMA DEPARTMENT OF POLLUTION CONTROL
P.O. Box 53504
Oklahoma City, OK 73152
TEL: (405) 521-2384

OREGON DEPARTMENT OF AGRICULTURE
Natural Resources Division
635 Capitol Street, NE
Salem, OR 97310
TEL: (503) 378-3810

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
811 SW 6th Avenue
Portland, OR 97204
TEL: (503) 229-5630

RESOURCE INFORMATION

STATE OF WASHINGTON CONSERVATION COMMISSION
Mail Stop PV-11
Olympia, WA 98504-8711
TEL: (206) 438-7883

WASHINGTON STATE DEPARTMENT OF ECOLOGY
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WYOMING WATER DEVELOPMENT COMMISSION
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